

SUBSTANCES IN RAINS AND SNOWS

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The fact that certain substances are dissolved in rain and snow has led to considerable work in the laboratories of a great many colleges and universities. This has had special attention at Cornell College for some years (1) and the following is a report of the quantitative analysis covering a period of the past two years.

Our special purpose is to determine the amounts of nitrogen compounds, chlorine, and sulfates in the rains and snows of this locality.

The work was carried on in a private laboratory free from the usual laboratory fumes, the samples were collected in enamelware pans near the center of the residence district of Mount Vernon, Iowa. There are no manufacturing industries within a radius of seventeen miles. Throughout the work every possible precaution was taken to avoid contamination. Samples were promptly collected and determinations were made as soon as possible thereafter.

Altogether 70 samples were analyzed of which 13 were snow. Twelve inches of snow were taken to equal one inch of rain. In order to determine the number of pounds of each substance that fell per acre, we took 226,000 pounds to be the weight of one inch of rain on an acre.

The precipitation contains varying amounts of chlorine. Our theory regarding this is that since the precipitation seems to come from the East, the salt particles are probably carried from the Atlantic Ocean. The spray on the shore may be caught by the wind and borne across the continent, until it descends in solution with the rains and snows. The chlorine was determined with hundredth normal silver nitrate using neutral potassium chromate as the indicator.

The textbook followed in this work was "Quantitative Chemical Analysis" by Dr. N. Knight, with occasional reference to the "Report of Committee on Standard Methods of Water Analysis to the Laboratory Section of the American Public Health Association."

TABLE 1.—Amounts of certain substances dissolved in rain and snow, as observed at Cornell College, Mount Vernon, Iowa

Date	Precipitation	Nitrates	Nitrites	Free ammonia	Albuminoid ammonia	Sulfates	Chlorine
	Inches	Lbs. per acre	Lbs. per acre	Lbs. per acre	Lbs. per acre	Lbs. per acre	Lbs. per acre
1924							
Sept. 19.....	0.50	0.0407	0.0024	0.7345	0.3955	2.6202	1.203
Sept. 21.....	.15	.0061	Trace	.2034	.1186	.8303	.409
Sept. 27.....	.20	.0285	None	.1808	.1582	2.1864	.508
Oct. 4.....	.20	.0326	None	.3616	.2034	3.7639	.642
Oct. 8.....	.50	.0616	.0102	.5085	.3955	8.1644	1.605
Oct. 30.....	.40	.1954	None	.2712	.3616	3.9833	1.605
Nov. 6.....	.50	.2239	None	.8475	.3390	6.3665	.802
Nov. 8.....	.20	.0651	.0007	.1582	.1808	1.5499	.963
Nov. 13.....	.30	.0733	.0005	.1695	.3955	1.2039	1.685
Dec. 5.....	1.10	.4325	.0045	1.1187	.6215	6.4798	1.785
Dec. 14.....	.33	.1746	None	.3000	.3752	None	1.588
Dec. 21.....	.50	.2035	.0061	.3955	.2825	1.1347	1.203

TABLE 1.—Amounts of certain substances dissolved in rain and snow, as observed at Cornell College, Mount Vernon, Iowa—Continued

Date	Precipitation	Nitrates	Nitrites	Free ammonia	Albuminoid ammonia	Sulfates	Chlorine
	Inches	Lbs. per acre	Lbs. per acre	Lbs. per acre	Lbs. per acre	Lbs. per acre	Lbs. per acre
1925							
Jan. 16.....	0.33	0.6341	0.0068	0.3005	0.3752	11.5271	0.794
Feb. 8.....	.33	.1489	.0011	.3005	.6780	5.0232	1.059
Feb. 15.....	.25	.0916	.0010	.3119	.1505	2.5254	.481
Feb. 20.....	.15	.0611	.0013	.3390	.3051	(1)	.334
Feb. 22.....	.10	None	.0007	.0904	.2260	1.5083	.241
Mar. 1.....	.33	.0676	.0008	.5266	.3006	.3927	.422
Mar. 8.....	.13	.0635	.0013	.1175	.2644	2.2307	.271
Mar. 14.....	1.00	.2442	.0008	1.8080	.7910	2.8229	1.605
Mar. 18.....	.10	.0285	.0023	.4068	.1017	1.1347	.241
Apr. 9.....	.25	.0814	.0051	.6780	.1695	7.0403	.199
Apr. 16.....	.25	.3053	.0037	.2543	.1978	4.4282	.602
Apr. 23.....	1.25	.4070	.0061	1.4125	.8475	1.3492	2.006
Apr. 25.....	.25	.0611	.0006	.2825	.2260	6.0887	.482
Apr. 29.....	.65	.0794	.0011	.4972	.2938	22.3068	.834
May 3.....	.13	.1058	.0034	.1763	.1469	2.9503	.313
May 16.....	.50	.1221	.0004	.7345	.3390	7.3341	.802
May 18.....	.10	.0448	None	None	None	(1)	.241
May 20.....	.12	.2442	.0033	.2170	.2305	4.6772	.193
June 1.....	.25	None	.0051	.2543	.2260	8.649	.281
June 2.....	1.75	None	.0035	1.3843	.9887	16.7440	2.808
June 3.....	2.00	.8140	.0016	.4520	.7684	27.3992	1.605
Total in pounds per acre.....	15.10	4.6524	.0744	15.7935	11.4539	165.6412	29.792
June 15.....	.50	.5698	.0004	.1266	.0283	.3459	.802
June 17.....	2.00	.0407	None	.0181	.0615	5.2584	6.418
June 22.....	.90	.0366	None	.0651	.0325	1.6191	2.882
June 24.....	.60	.1465	None	.1844	.0325	2.0767	1.925
Sept. 20.....	.10	.0285	None	.0081	(1)	.3459	.209
Sept. 30.....	4.60	.3663	None	.5895	.1139	9.9634	10.831
Oct. 3.....	2.00	.0407	Trace	.1446	.1085	4.4282	3.530
Oct. 5.....	.20	.1465	.0002	.0163	.0145	.3598	.321
Oct. 6.....	1.00	.1221	None	.1085	.0181	2.7696	1.765
Oct. 8.....	.20	.0407	Trace	.0163	.0018	.3575	.353
Oct. 11.....	.60	.0733	Trace	.0488	.0825	2.4908	1.412
Oct. 12.....	.70	.1139	Trace	.1139	.0633	1.8405	1.685
Oct. 25.....	.33	.0537	Trace	.0542	.0004	.7749	.688
Oct. 27.....	.42	.0509	Trace	.0339	.0105	.8137	.876
Nov. 4.....	.50	.1018	None	.0149	.0181	.9687	.802
Nov. 7.....	.66	.0814	Trace	.0118	.1627	.3681	1.230
Nov. 29.....	.50	.0407	Trace	.0090	.0181	.2770	.802
Dec. 5.....	1.10	.0895	Trace	.0895	.0597	1.8279	1.765
Dec. 15.....	.50	.0407	None	.0226	.0045	1.4540	1.211
1926							
Jan. 4.....	.90	.6593	Trace	.0163	.0692	4.2375	2.021
Jan. 12.....	4.00	.8140	Trace	.1446	.0362	5.5392	9.627
Jan. 28.....	.33	.3907	Trace	.0271	.0181	2.0107	.529
Feb. 18.....	1.00	.4477	.0244	.0814	.0248	2.3542	1.605
Feb. 25.....	2.00	.3256	.0293	None	.1627	7.0781	5.767
Mar. 6.....	.40	.1628	.0130	None	.0362	1.4945	2.952
Mar. 14.....	.25	.0305	.0055	None	.0226	.3459	.883
Mar. 28.....	.50	.0611	.0098	.0542	.0814	.6619	1.043
Mar. 31.....	.50	.0611	.0103	.0045	.0814	.5535	1.284
Apr. 2.....	.27	.2442	.0483	(1)	(1)	.9216	5.776
Apr. 6.....	.50	.0407	.0109	.0045	.0813	1.7989	3.530
Apr. 18.....	.50	.1018	.0244	.0814	.0362	2.6984	1.364
Apr. 24.....	1.00	.0407	.0244	.1627	.0542	1.5221	2.888
May 2.....	.25	.1018	.0061	.0407	.0226	.3805	.569
May 13.....	.75	.0916	.0165	.0542	(1)	.7265	1.203
May 18.....	.50	.0407	.0122	.0814	.0542	.5535	.802
May 24.....	1.00	.0814	.0195	.0633	.0362	.9687	1.605
May 31.....	.50	.0204	.0122	.0316	.0362	.3681	.882
Total in pounds per acre.....	32.46	5.9004	.2685	2.5040	1.6349	72.6129	83.837

(1) Not tested.

LITERATURE CITED

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